DOCUMENT RESUME

ED 144 369 FL 008 854

AUTHOR de Johnson, Teresa H.; O'Connell, Daniel C.
TITLE Temporal Analysis of English and Spanish Narratives.
PUB DATE 28 Apr 77
NOTE 16p.; Paper presented at the Joint Meeting of Missouri and Illinois Academy of Sciences (St. Louis, Missouri, April 1977)

EDRS PRICE MF-$0.83 HC-$1.67 Plus Postage.
DESCRIPTORS Articulation (Speech); *Cognitive Processes; *Contrastive Linguistics; *English; Language Patterns; Language Usage; *Narration; Native Speakers; Paralinguistics; Psycholinguistics; *Spanish; *Speech
IDENTIFIERS *Hesitation Studies (Speech); Pausing (Speech)

ABSTRACT

In order to ascertain the effect of different demands on cognitive processes as reflected in speech rate, pause and hesitation phenomena, 90 young men, 45 native speakers of English (U.S.A.) and 45 native speakers of Spanish (Mexico), were asked to retell a story presented in one of three ways: (1) film plus narration; (2) film only; (3) narration only. Narrations were in subjects' native language. A certain parallelism in performance of both language groups was evident in the consistency of results across modes of presentation in articulation rate, speech rate, phrase length, and frequency and length of unfilled pauses. Language-specific differences were found in occurrence of parenthetical remarks and filled pauses. This analysis was found successful in differentiating some cognitive processes involved in retelling a story presented in various modes. Results support a theory of speech production which includes cognitive activity concurrent with the act of speech production as one of the multiple determinants of hesitation. These aspects of speech generation are not necessarily evident in the semantic or grammatical structure of produced discourse. Cross-linguistic comparisons support reliability of paralinguistic measures to study relationship of thought and language. (Author)

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TEMPORAL ANALYSIS OF ENGLISH AND SPANISH NARRATIVES

Abstract

In order to ascertain the effect of different demands on cognitive processes as reflected in speech rate, pause and hesitation phenomena, ninety young men, forty-five native speakers of English (U.S.A.), and forty-five native speakers of Spanish (Mexico) were asked to retell a story presented in one of three ways: 1)film plus narration; 2)film only; 3)narration only. Narrations were in subjects' native language.

A certain parallelism in performance of both language groups was evident in the consistency of results across modes of presentation in articulation rate, speech rate, phrase length, and frequency and length of unfilled pauses. Language-specific differences were found in occurrence of parenthetical remarks and filled pauses.

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Teresa H. de Johnson and
Daniel C. O'Connell
Saint Louis University
Saint Louis, Missouri 63103

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TEMPORAL ANALYSIS OF ENGLISH AND SPANISH NARRATIVES

The production of speech takes place over time. The study of the temporal measurements of speech, and the careful analysis of where and for how long an individual pauses, and what use is made of hesitation devices, offers a more complete speaker model, one which takes into consideration both the cognitive and the linguistic processes occurring at the moment of the production of discourse.

A basic consideration in this research is that pauses and hesitation devices are not regarded as disfluencies that "impoverish" the speech produced, but rather that this phenomena is usually functional both in the production and in the understanding of speech. Goldman-Eisler, pioneer in the field of pausology, stated: "Hesitation is to taken as speech behavior which is synchronous with and indicative of, encoding processes responsible for generation of information" (1968, p. 51).

In this context, a difference is made between silence, or unfilled pauses, and filled pauses: non-lexical items that serve as fillers" (, æ, r, m). Unfilled pauses are usually referred to simply as "pauses," while filled pauses are included in vocal hesitations.

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Speech rate, pauses, and other hesitation phenomena such as parenthetical remarks, filled pauses, repeats, and false starts, have been studied from several points of view: as indices of emotional states (Mahl, 1958), as differentiators of levels of proficiency of foreign language (Bryant, 1972), and of proficiency of native language (O'Connell, Kowal and Hormann, 1969). Developmental patterns in speech rate and in the use of hesitation devices were found by O'Connell and associates (1976). The present research analyzed speech rate and hesitation phenomena of adolescents, native speakers of English and Spanish, with a view that the temporal analysis of spontaneously produced speech can yield valid indicators essential to a complete explanation of speech behavior.

An understanding of speech behavior demands that theoretical constructs take into account temporal analysis of language, so that both the cognitive and linguistic processes, which are reflected in temporal measures, can be incorporated in the development of a viable theory of speech production. This study subscribed to a multiple determination of hesitation phenomena, and while the primary interest of the present research was on the psycholinguistic factors that affect speech production, other factors such as articulation rate, phonology, linguistic structure, emotional state, were all considered as possible causes of variation in temporal measurements, their effect being reflected in the speech rate, pauses, and hesitation phenomena included in the speech generated.

It must be noted that these aspects of speech production are not necessarily evident in the semantic or grammatical structure of the produced discourse, but are reflected in the pause and hesitation pattern.

Paralinguistic studies have been reported mostly in the English language, with a limited amount of research reported in German (O'Connell, 1969), Hungarian (Fonagy and Magdics, 1960), Japanese (Osser and Peng, 1964), and French (Grosjean and Deschamps, 1972). Results of temporal analysis in these languages have been found sensitive to context, task difficulty, and social interaction. Cross-cultural studies of paralinguistic phenomena, based on the same methodology, can lend further support to the observations that have already been made in English. Because of this sensitivity of the measures to task, situation, experimental condition, etc., it is most important that comparisons be made carefully and that objective methods be employed to identify the location and length of unfilled pauses, as subjective methods have been found inadequate to provide reliable data. While physiological, linguistic, perceptual and other factors affect the temporal aspects of speech production, it is the dynamic interaction of language and thought at the actual moment of speech production that can be ascertained through the observable, measurable aspects of the generation of speech which occurs in real time.

The present study was designed to study the effect of mode of presentation in native language narrative as reflected in speech rate, location, and frequency of unfilled pauses and the occurrence of other hesitation phenomena. Ninety young men, forty-five native speakers of English from St. Louis, Mo., and forty-five native speakers of Spanish, from San Luis Potosí, Mexico, comprised the subjects of the study. Although socio-cultural variables were not under study, care was taken that educational and socio-economic backgrounds of subjects were as similar as possible. In order to compare the performance of the two language groups, a 3 x 2 factorial design was used; the main factors were mode of presentation

and native language. Subjects were asked to retell a story which had been presented in one of three ways: film with sound (narration of what was taking place in the film); film only, no sound; narration only, no film. Film script and narrations were in the subject's native language. Although the length of the stimulus in terms of time was the same in each presentation, a differentiation in the performance of subjects was expected due to differences in conveying the information: in different modes, and via different senses, which were expected to demand different levels of cognitive processes for decoding the story and then encoding it in their own words.

Tape recordings were made of the subjects' discourse, who came one by one to experimenter both in Mexico and in St. Louis. These tape recordings were used to produce a permanent graphic record in terms of amplitude of acoustic energy over time, from which all the temporal measures and the location of pauses were assessed.

The following general hypothesis were formulated: 1) Speech rate, within a certain range, and the function of pauses, were expected to be approximately the same for both language groups. 2) Mode of presentation was expected to affect both groups in approximately the same manner, this effect to be reflected in temporal measures and hesitations of speech generate.

Although twelve response measures were submitted to factorial Analysis of Variance, the following response measures will be discussed, as they exemplify the findings of this study: Total production time and story length; speech rate, phrase length, and adjusted length of vocal hesitations.

Analyses of variance yielded the following:

Mode of presentation main effect: significant differences in story length, total production time, and actual speaking time.

Language main effect: significant differences were found in story length, speech rate, articulation rate, percentage pause time, and adjusted length of vocal hesitations.

No significant interactions between mode of presentation and language were found.

Thus, the amount of production was affected primarily by mode of presentation; temporal quality of the production was affected primarily by native language.

Handout

Total Production time and story length. As hypothesized, the effect of mode of presentation was consistent in both languages; similar effects were found in the time needed to retell the soty, either in English or in Spanish. The shortest retellings, both in total and in actual speaking time, were in response to the visual only mode of presentation. The fact that the subjects received non-verbal information and then had to interpret in terms of language what they had seen, probably accounted for this reduced performance. Audio-visual presentation, where most information was given, yielded the fastest speech rate, even though the stories were of medium length. In general, English samples were shorter, both in number of syllables and in length in terms of seconds. The high frequency of monosyllabic words in English is reflected in the higher number of words in the

English samples, even though Spanish samples contain approximately 2,300 more syllables than the English samples. This difference in the average word length in Spanish probably accounts for the significant difference found in the number of syllables, STORY LENGTH, under both main factors, for, while the Spanish subjects produced less words, they would have needed more syllables to retell their stories in comparison with the English subjects.

Speech rate. While speech rate was found to be different in English and in Spanish, the same pattern of parallelism appears: the audio-visual presentation, which furnished both the images and the auditory stimulus resulted in the fastest samples in terms of syllables per second, since cognitively the subject was supplied with both the visual and the verbal information. The slower speech rate found as a result of the visual and the auditory presentations reflect the greater cognitive demands placed by a task which requires greater organization and interpretation on the part of the speaker. Greater availability of words (and concentration on this type of information) is reflected in the greater length of stories in the auditory presentation. Subjects were able to retell more of the story under this presentation, but a longer time spent pausing is reflected in shorter phrase length.

Although analysis of variance results yielded significant differences in speech rate between English and Spanish, it must be noted that the range is well within the reported speech rates in other studies in different languages.

Phrase length. Phrase length was shorter in English, which is a

consequence of the greater number of unfilled pauses per narrative found in English, although the total number of unfilled pauses was smaller in English.

Unfilled pauses. Average length of unfilled pauses was shorter in English. A greater number of unfilled pauses and their longer length account for a longer percentage pause time in Spanish than in English.

VOCAL HESITATIONS

Repeats, parenthetical remarks, filled pauses and false starts were studied as to frequency of occurrence and as to length in terms of syllables. Filled pauses are considered one syllable in length by definition.Table 5 shows the percentages of frequency of occurrence of these hesitations, both in terms of total hesitations, which include the silent hesitation, the unfilled pause, and in terms of vocal hesitations. Language specific differences in the choice of hesitation devices is apparent in the remarkably different percentage of subjects who used the parenthetical remark, with 93% of the Spanish subjects using this hesitation, and only 62% English subjects using it. On the other hand, 95% of the English subjects used the filled pause, while only 35% of the Spanish subjects used this device. This language specific difference is even more evident in Table 9 which shows the frequency and length of hesitations. Only 27 instances of filled pause were found in Spanish, 182 in English. The length in syllables of the parenthetical remarks shows the difference in the use of this hesitation device: 430 syllables in Spanish, 81 in English. This difference accounts for the significant difference found in the analysis of variance for the adjusted length of vocal hesitations.

But, while the choice of hesitation devices at a particular point appears to be language specific, not so the percentage of subjects who used the unfilled pause (100% in each language) and the false start (84% in Spanish, 78% in English). In summary, Spanish speakers used more syllables in vocal hesitations, the largest percentage was used in parenthetical remarks (este, bueno, pues).

In conclusion we can say that analysis of temporal aspects of speech production (speech rate, pause pattern, hesitations) was found successful in differentiating some of the cognitive processes involved in the retelling of a story presented in various modes. The results lend support to a theory of speech production which takes into consideration the multiple determination of hesitation phenomena, and which includes as one of these determinants the cognitive activity taking place concurrently with the act of speech production. These aspects of speech production are not necessarily, or always, evident in the semantic or grammatical structure of the produced discourse, hence the usefulness of the analysis of the pause and hesitation pattern found in the produced discourse. The response measures used in the present research have shown much reliability across modes of presentation and across languages. Comparisons made with other research, both in English and in other languages, lend additional support to the reliability of the paralinguistic measures used to study the relationship of thought and language at the moment of speech production.

Presenter: T. H. Johnson
Dept. of Modern Languages
Saint Louis University
Saint Louis, Mo. 63103

TABLE 1

Analyses of Variance Results

Response Measures		F Ratios and Probability Levels (p) for Factor A (Mode of Presentation), Factor B (Language) and Interaction		
		Presentation	Language	Interaction
Total Production Time	F	6.630	1.772	.085
	p	.002	.183	.917
Actual Production Time	F	5.152	.396	.173
	p	.007	.537	.842
Story Length	F	5.886	11.7271	.0138
	p	.0044	.0013	.9871
Speech Rate	F	1.1883	25.9335	.0170
	p	.3097	.0001	.9840
Articulation Rate	F	1.0741	58.6437	.0054
	p	.3471	.0001	.9950
Phrase Length	F	8208	.9515	.0172
	p	.5529	.6665	.9837
Percentage Pause Time	F	.3227	5.3979	.1499
	p	.7298	.0213	.8614
Adjusted Frequency of UP	F	.6250	2.3514	.5635
	p	.5426	.1250	.5767
Adjusted Length of UP	F	.2059	.0623	.1249
	p	.8163	.7990	.8826
Adjusted Frequency of Vocal Hesitations	F	.2506	2.7537	1.1296
	p	.7821	.0968	.3284
Adjusted Length of Vocal Hesitations	F	1.1110	7.1894	.6680
	p	.3346	.0087	.5200
Adjusted Frequency of Total Hesitations	F	.643	.359	.606
	p	.528	.550	.547

TABLE 2

Means ($\bar{X}$) and Standard Deviations (SD)
for Response Measures of Analyses of Variance

Response Measures		English	Spanish
Total Production Time	$\bar{X}$	46.394	50.965
	SD	15.431	18.688
Actual Production Time	$\bar{X}$	34.044	35.616
	SD	11.760	13.960
Story Length	$\bar{X}$	165.11	214.93
	SD	56.507	84.715
Speech Rate	$\bar{X}$	3.663	4.236
	SD	.458	.592
Articulation Rate	$\bar{X}$	5.002	6.085
	SD	.525	.777
Phrase Length	$\bar{X}$	9.960	10.281
	SD	2.924	3.251
Percentage Pause Time	$\bar{X}$	26.666	30.270
	SD	6.714	7.662
Adjusted Frequency of Unfilled Pause	$\bar{X}$	.117	.099
	SD	.075	.022
Adjusted Length of Unfilled Pause	$\bar{X}$	75.054	73.752
	SD	24.362	25.005
Adjusted Frequency Vocal Hesitations	$\bar{X}$	.048	.060
	SD	.031	.034
Adjusted Length Vocal Hesitations	$\bar{X}$	.071	.102
	SD	.051	.059
Adjusted Frequency Total Hesitations	$\bar{X}$	.155	.162
	SD	.052	.047

TABLE 3

Frequency (f) and Length (l)* of Hesitations

According to Presentation in Each Language

Type of Hesitation		Spanish				English			
		Audio-Visual	Visual	Auditory	Total	Audio-Visual	Visual	Auditory	Total
Unfilled Pauses	f	326	270	352	948	281	221	302	804
	l	-	-	-	-	-	-	-	-
Parenthetical Remarks	f	93	82	78	253	16	19	14	49
	l	140	156	134	430	24	34	23	81
False Starts	f	42	34	67	143	35	28	26	89
	l	82	78	142	302	87	78	27	192
Repeats	f	55	48	74	177	9	4	35	48
	l	74	58	90	222	15	5	38	58
Filled Pauses	f	3	13	11	27	76	66	40	182
	l	3	13	11	27	76	66	40	182

*Length (l) expressed in syllables

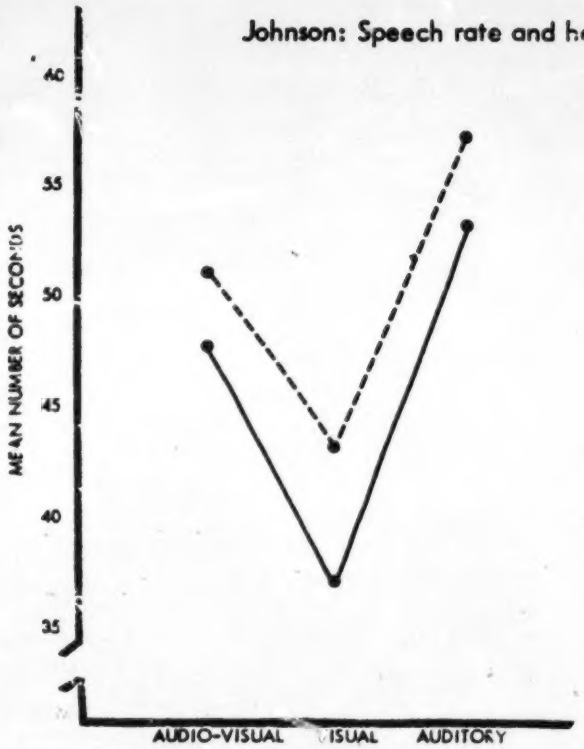

FIGURE 1. TOTAL PRODUCTION TIME, IN SECONDS

ENGLISH ———
SPANISH- - - - - - -

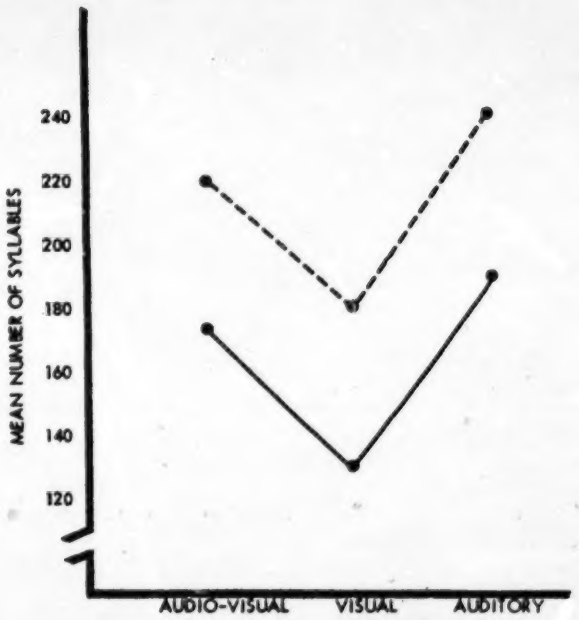

FIGURE 3. STORY LENGTH, IN SYLLABLES.

ENGLISH ———
SPANISH- - - - - - -

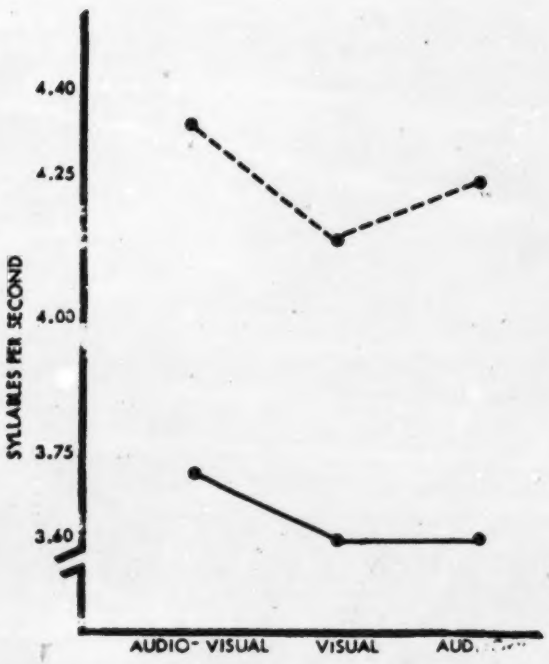

FIGURE 4. SPEECH RATE, SYLLABLES PER SECOND.

ENGLISH ———
SPANISH- - - - - - -

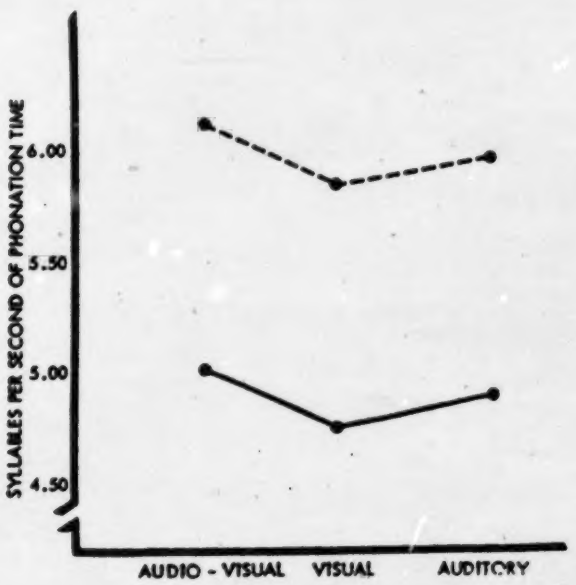

FIGURE 5. ARTICULATION RATE, SYLLABLES PER SECOND OF PHONATION TIME.

ENGLISH ———
SPANISH- - - - - - -

TABLE 5

Percentages of Frequency of Occurrence of Hesitations by Type, and Percentages of Subjects Who Used Each Type of Hesitation at Least Once by Language

Type of Hesitation	Percentages of Total Hesitations		Percentages of Vocal Hesitations		Percentage of Subjects	
	Spanish	English	Spanish	English	Spanish	English
Unfilled Pauses	35	30	-	-	100	100
Parenthetical Remarks	9	2	26	5	93	62
False Starts	5	3	15	9	84	78
Repeats	6	2	18	5	77	42
Filled Pauses	1	7	3	19	35	95

TABLE 9

Frequency (f) and Length (l)* of Hesitations According to Presentation in Each Language

Type of Hesitation		Spanish				English			
		Audio-Visual	Visual	Auditory	Total	Audio-Visual	Visual	Auditory	Total
Unfilled Pauses	f	326	270	352	948	281	221	302	804
	l	-	-	-	-	-	-	-	-
Parenthetical Remarks	f	93	82	78	253	16	19	14	49
	l	140	156	134	430	24	34	23	81
False Starts	f	42	34	67	143	35	28	26	89
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	l	74	58	90	222	15	5	38	58
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*Length (l) expressed in syllables

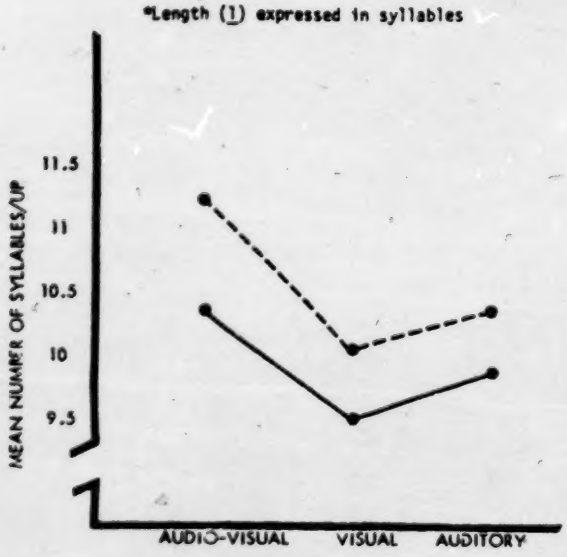

FIGURE 6. PHRASE LENGTH (NUMBER OF SYLLABLES PER UNFILLED PAUSE).

ENGLISH———
SPANISH------

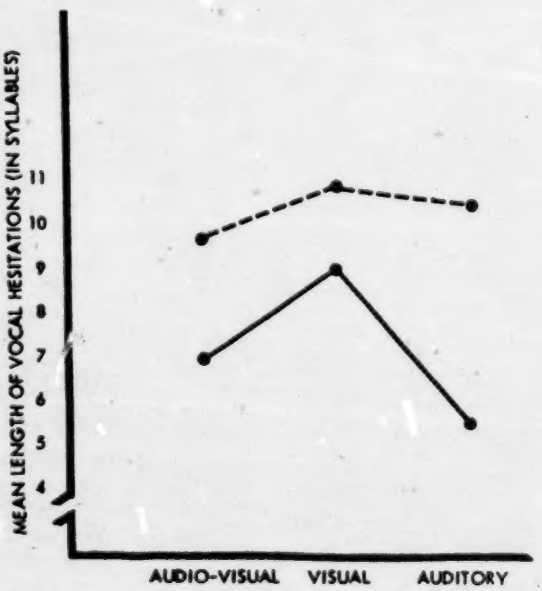

FIGURE 12. ADJUSTED LENGTH (IN SYLLABLES) OF VOCAL HESITATIONS (PER 100 SYLLABLES).

ENGLISH———
SPANISH------